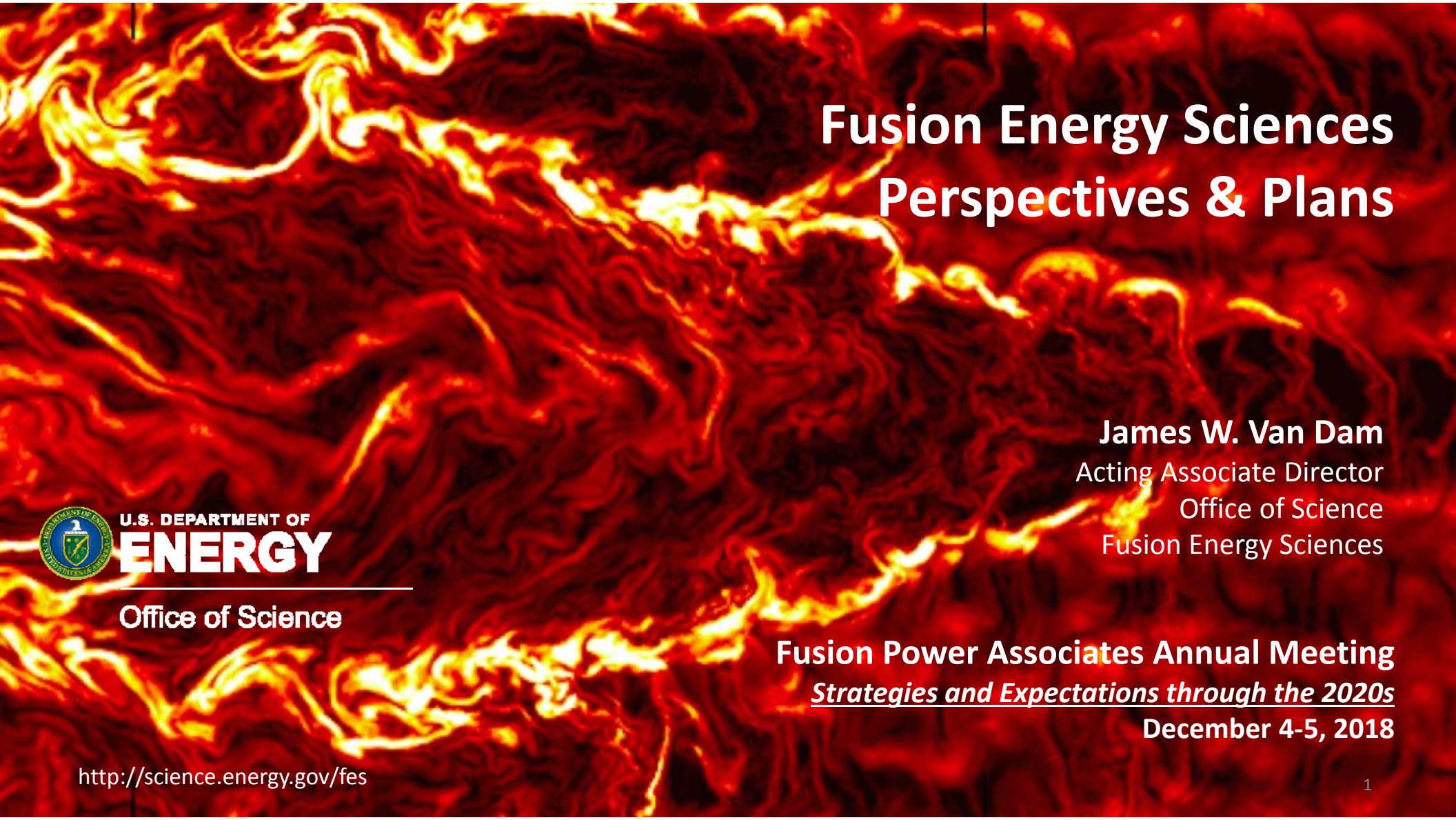

Fusion Energy Sciences Perspectives & Plans

James W. Van Dam
Acting Associate Director
Office of Science
Fusion Energy Sciences

U.S. DEPARTMENT OF ENERGY
Office of Science

Fusion Power Associates Annual Meeting
Strategies and Expectations through the 2020s
December 4-5, 2018

http://science.energy.gov/fes

1. Budget Updates

U.S. DEPARTMENT OF ENERGY
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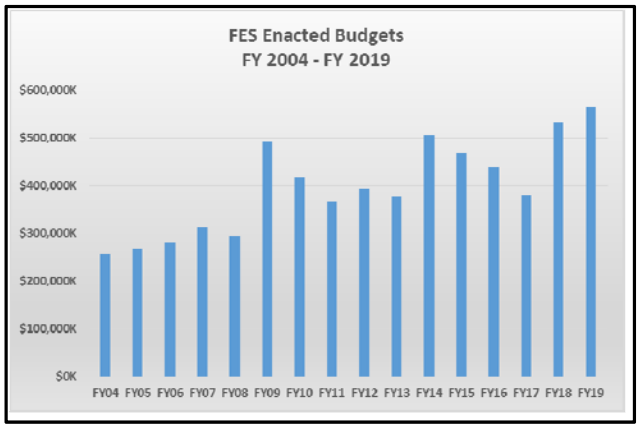
Robust FY 2018 and FY 2019 enacted budgets

Enacted FES appropriations for FY 2018 ($532M) and FY 2019 ($564M) enable accelerated progress throughout the program:

- **ITER**: Continued progress on U.S. Contribution to ITER project with emphasis on highest-priority First Plasma activities
- **DIII-D**: Initiated over $20M of enhancements and infrastructure improvements for the DIII-D user facility to maintain and advance its world-leading research capabilities
- **NTSX-U**: Accelerate the Recovery efforts
- **LaserNetUS**: Established a U.S.-wide network of nine mid-scale laser facilities at universities and national laboratories to expand user access to high-power lasers
- **MPEX Facility**: Initiated the Materials Plasma Exposure eXperiment (MPEX) MIE project as a new world-class high-heat-exposure facility for testing fusion materials
- **Theory & Simulation**: Accelerate progress in Whole-Device Modeling and Exascale readiness; strengthen support for fusion-relevant Machine Learning applications
- **Private-Public Partnerships**: Planning underway to initiate high-impact public-private partnerships as a pilot program to leverage opportunities in critical fusion research areas and accelerate progress toward the development of fusion energy
- **QIS**: Start pilot efforts in Quantum Information Science that can advance both the FES mission and also the development of QIS

DOE Website (August 2, 2018)



Budget Trends

2. Programmatic Updates

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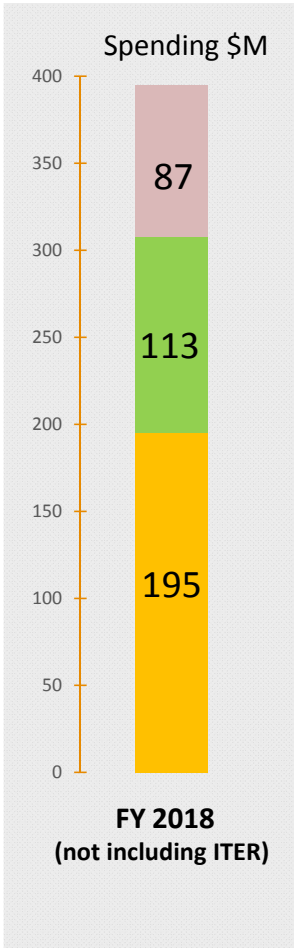
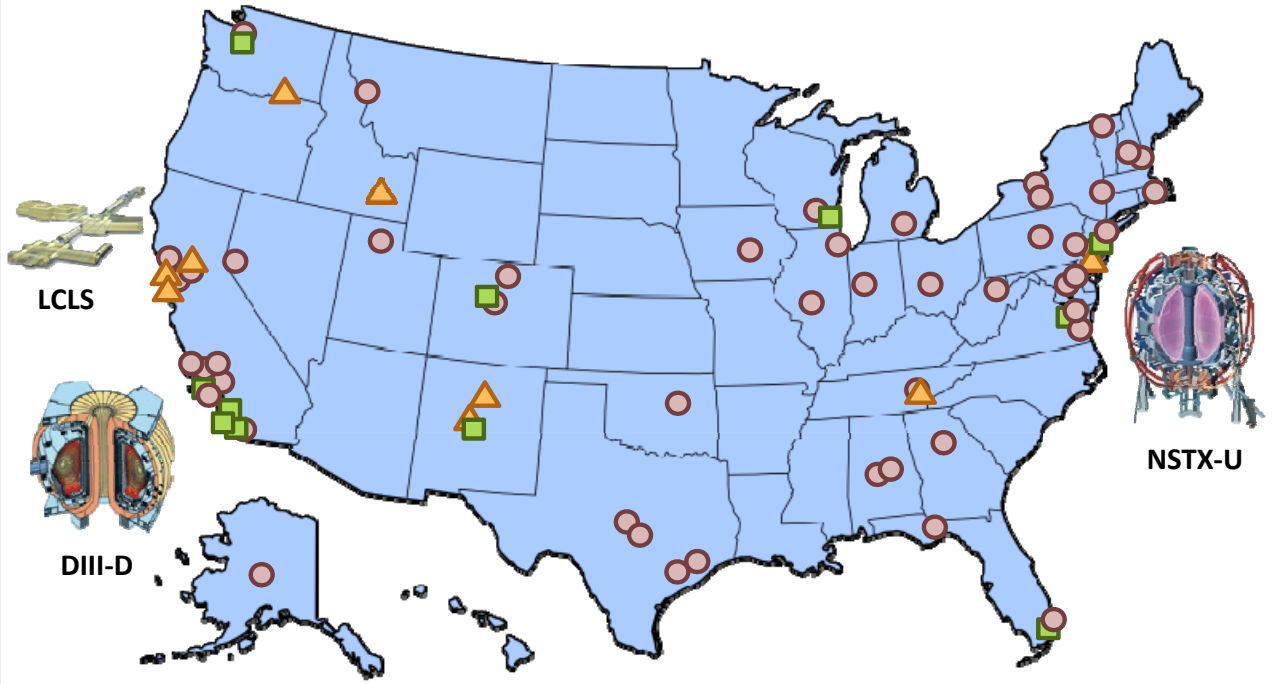
FES research is carried out at a diversity of US institutions



38 universities

11 industry

11 laboratories



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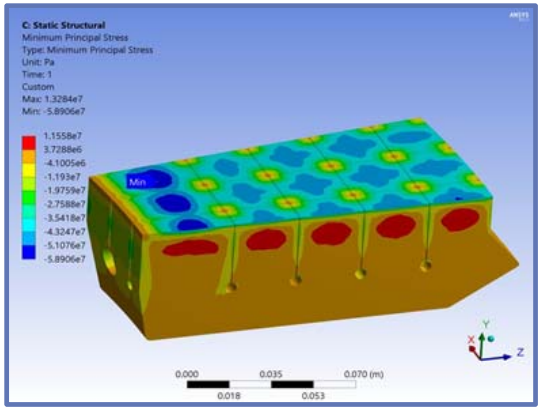
The PPPL project team has made progress towards recovery of NSTX-U

Important reviews, design work, and project activities:

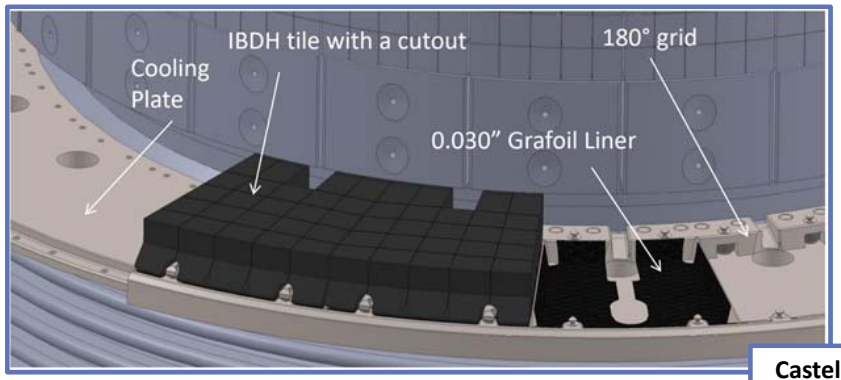
- ✓ A thorough assessment, conducted by 50+ external reviewers, identified all problems requiring repair to recover robust plasma operations
- ✓ PPPL has completed the preliminary design of the NSTX-U Recovery scope
- ✓ Early material procurements, coil prototyping and testing
- ✓ A baseline review of the total project cost and schedule is slated to take place in February of 2019



Engineering analysis of new castellated PFC tile design

TF/OH conductor bundle prior to a casing fit-up lift

Prototype coil testing to full field and current



Castellated tile in situ

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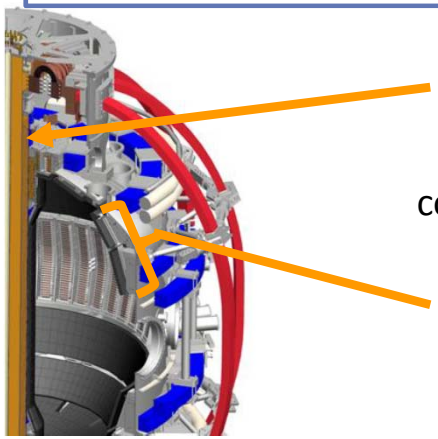
An independent panel of fusion experts reaffirmed the scientific mission for NSTX-U

Prof. Orbach led a DOE OPA subcommittee, which found:

- "Full exploitation of the NSTX-U facility is essential for critical tests of the potential advantages of the spherical tokamak for fusion power production."
- "In its chosen domain of exploration of high- performance, high-β, and low-collisionality plasmas, NSTX-U is and will be the world leader."



NSTX-U

NSTX-U central magnet provides **~2 x higher B_T^2** compared to MAST-U

NSTX-U conducting plates provide **~3 x higher total pressure** compared to MAST-U

MAST-U
Complementary ST facility in the UK
Dedicated on October 18, 2018

Dr. Raymond Orbach *(former DOE Under Secretary for Science, 2006-2009)*

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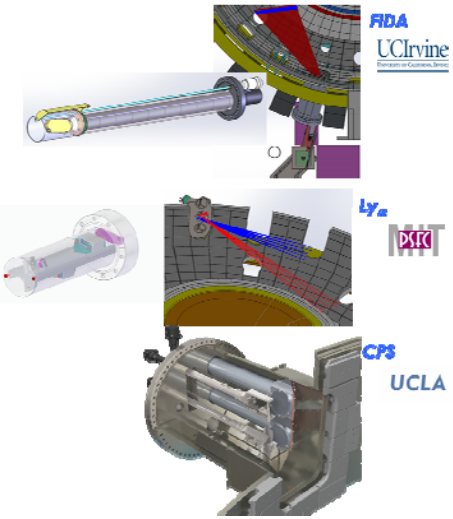
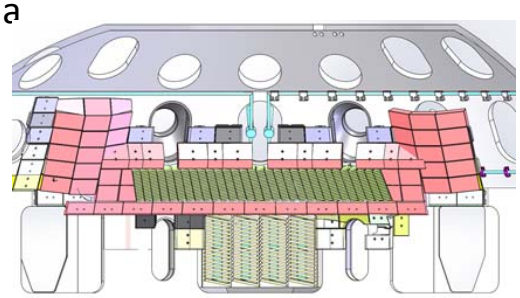
DIII-D Long Torus Opening (LTO)

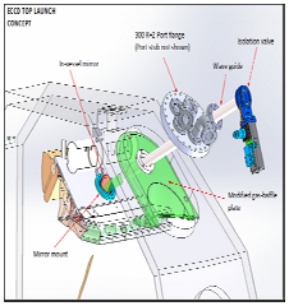
- **General Atomics will complete the LTO in April 2019 and operate DIII-D for up to 12 weeks in FY 2019**
- **Major ongoing LTO tasks include:**
  - New co/counter off-axis neutral beam modification
  - Top-launch ECCD capability
  - Installation of helicon strip-line antenna
  - New/upgraded diagnostics

New diagnostics

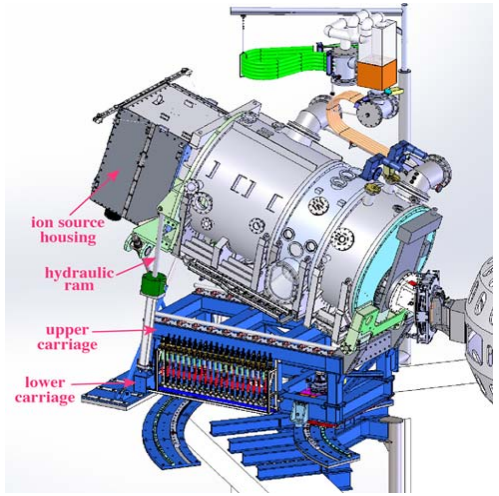


Helicon antenna





Top launch ECCD



Co/counter off-axis neutral beam

- **Other activities enabled by FY 2018 funding include:**
  - New helium liquefier and 3 replacement gyrotrons on order
  - Start of high-field-side LHCD project
  - New collaboration grants
  - Sustaining engineering work to increase facility reliability

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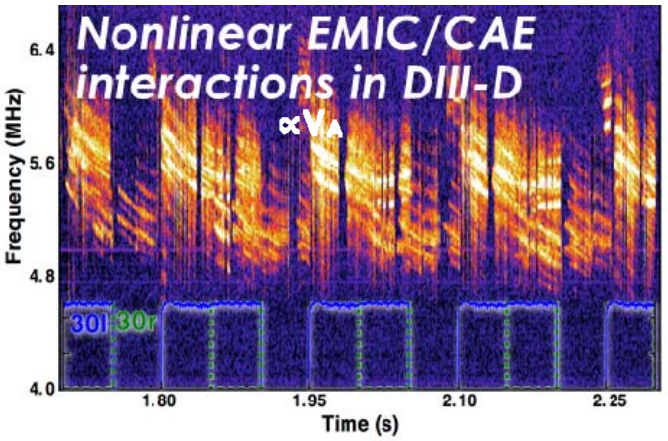
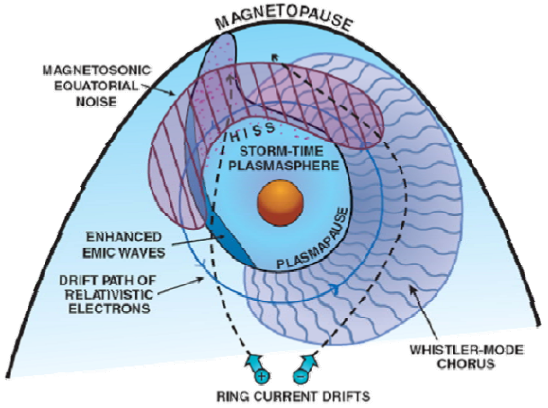
Frontier science experiments on DIII-D

- **In FY 2017, FES started a new initiative to focus some DIII-D experiments on frontier plasma science**
- **Whistler wave experiment resulted in a post-deadline invited paper at the 2017 APS-DPP meeting, a recent PRL paper** (Spong et al., 2018 *PRL* 120, 155002), **and 2018 APS-DPP oral presentation by Z. Williams (U. Wisc)**
- **Four experiments selected in 2018 utilizing 5 run days:**
  - EMIC waves: Leads W. Heidbrink (UCI)/S. Vincena (UCLA))
  - Runaway electrons & plasma waves: Lead D. Spong (ORNL)
  - Positron generation by runaways: Lead P. Aleynikov (IPP)
  - Sawtooth reconnection studies: Lead W. Fox (PPPL)
- **Engagement very positive, with visiting scientists impressed by the quality of DIII-D data**
- **Focus is now on analysis to obtain results from each study**
- **In FY 2019, the program will be assessed to evaluate progress and to integrate review and selection processes**



EMICs de-populate magnetosphere



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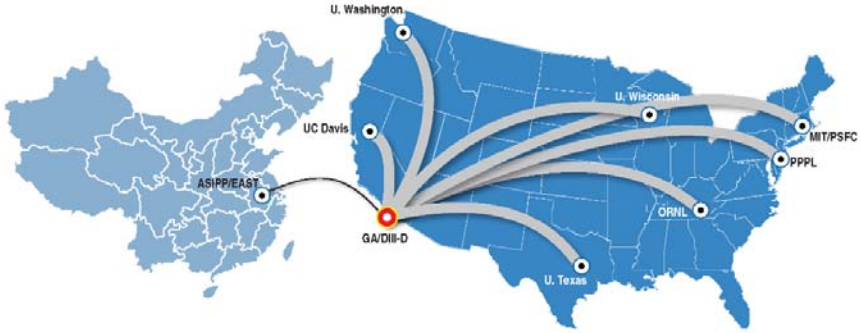
Remote tools are being made available to U.S. institutions to facilitate international collaboration

- **In FY 2018, 7 institutions used remote tools to connect remotely to EAST facility during evening in China**
  - GA, Lehigh U., LLNL, MIT, PPPL, UCLA, U. of Texas
  - 10 days of operations, ~250 shots
- **Services support non-trivial utilization of EAST facility, can be made available to any remote control room in U.S.**
  - Fast bulk data transfer avoiding bottlenecks
  - Real-time data, MDSplus data server
  - Multi-channel audio/video
- **Remote control rooms were also used to provide U.S. support to W7-X during recent campaign (OP1.2b)**

68 scientists from 9 U.S. research institutions can already access the services



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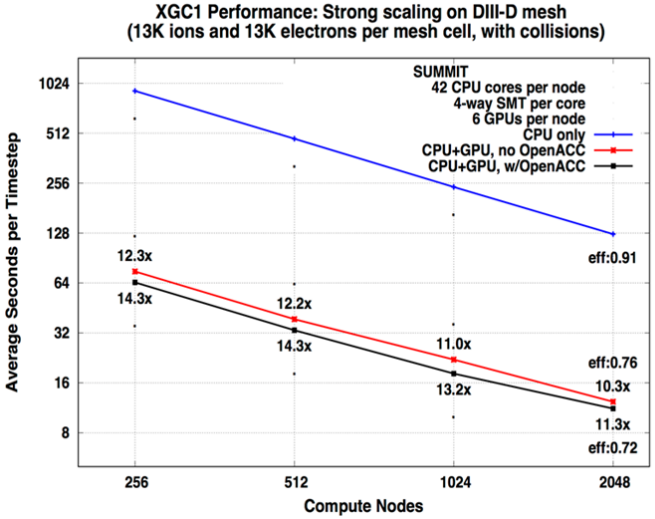
FES SciDAC portfolio continues to emphasize integration and whole-device modeling

- FES SciDAC-4 portfolio has nine multi-institutional and inter-disciplinary projects (seven supported both by FES and ASCR)
  - The ninth project added in FY 2018 is focused on runaway electron avoidance and mitigation
  - 11 universities, 8 DOE national laboratories, and 5 private industry institutions (including small businesses) in 13 states
  - Five of these projects are led by university scientists and the rest include substantial university participation
  - More details can be found at: https://scidac.gov/partnerships/fusion_energy.html
- FES SciDAC research activities are coordinated to accelerate progress toward whole-device modeling and increase synergy with the Theory and Exascale (ECP) programs
- New portfolio addresses research opportunities identified in recent community workshops



Strong scaling of the XGC1 code on maximal available Summit nodes, enabled by Center for Accelerated Application Readiness (CAAR)

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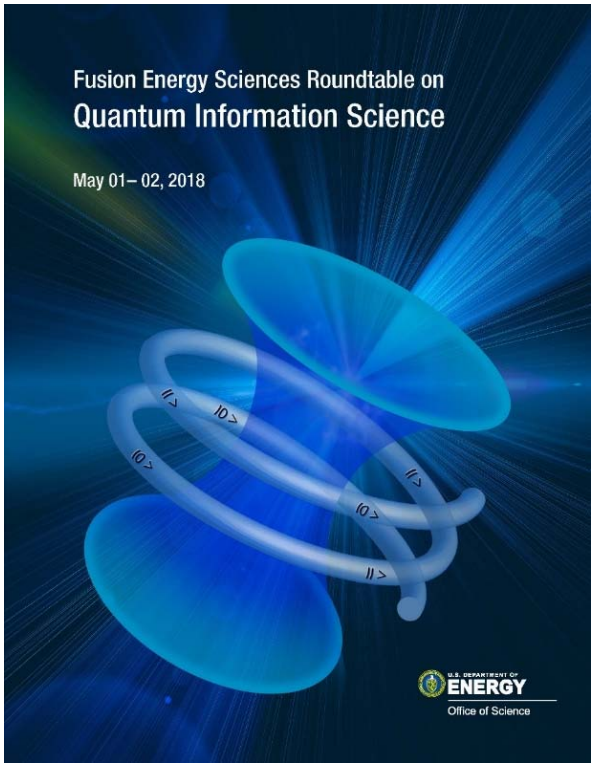
FES is exploring opportunities in QIS

- FES held a Roundtable meeting on **May 1-2, 2018**, to explore its role in **Quantum Information Science (QIS)**
  - Co-chaired by **Thomas Schenkel** (LBNL) and **Bill Dorland** (U Maryland)
  - Attended by **15** participants and several observers
- The meeting objectives were to:
  - Identify fundamental science supported by FES that could advance QIS development; and
  - Explore QIS applications that could have transformative impact on FES mission areas (e.g., fusion and discovery plasma science)
- Identified six compelling **Priority Research Opportunities**



Report available from:
https://science.energy.gov/~/media/fes/pdf/workshop-reports/FES-QIS_report_final-2018-Sept14.pdf

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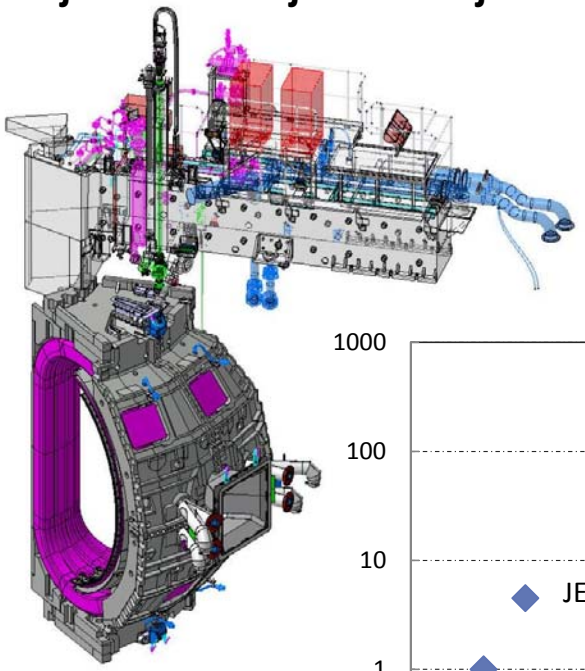
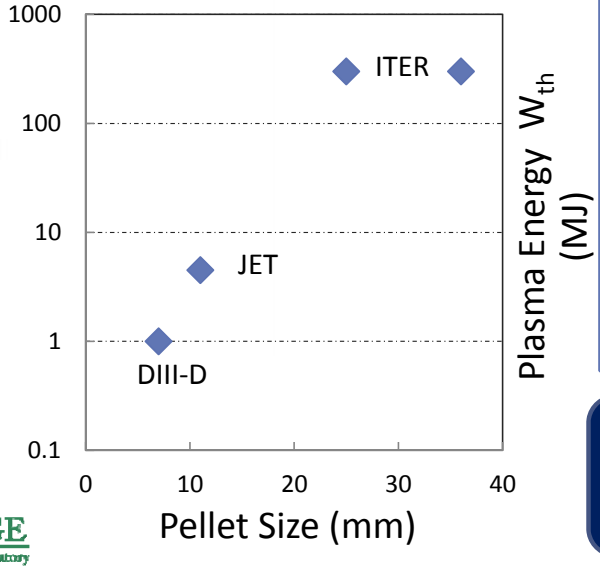
Disruption mitigation with shattered pellet injectors is a U.S. world-leading capability

JET shattered pellet injector (SPI) has ITER-like 3-barrel injector and injection trajectory





JET OAK RIDGE National Laboratory

Status of U.S. Contributions

- D-pellet injector from ORNL tested successfully
- Mechanical punch designed to dislodge high-Z pellets in the largest barrel works in the two smaller barrels
- SPI installed on JET; final commissioning in progress
- Disruption mitigation experiments utilizing JET-SPI are scheduled for the next campaign, starting in May 2019

Large collaborative effort involving JET/EUROfusion, ORNL, USIPO, ITER Organization, EC, and US DOE

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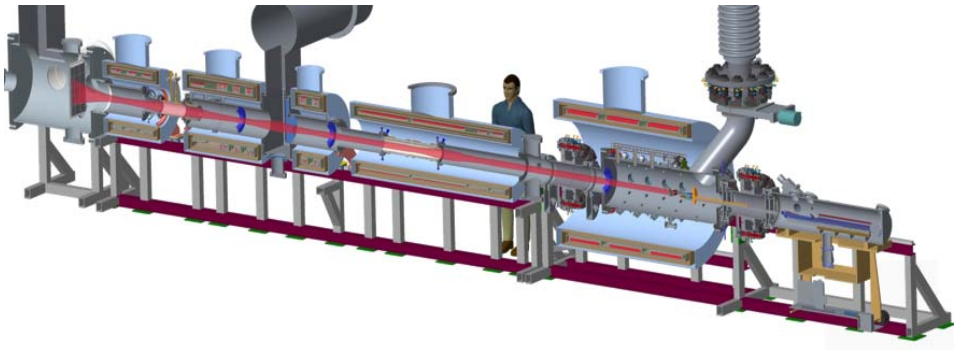
Materials Plasma Exposure eXperiment (MPEX) new MIE Project

- FES has initiated a new Major Item of Equipment (MIE) project with approval of the Scientific Mission Need for a Linear Divertor Simulator in March of 2018
- This project will enable new experimental capability for reactor-relevant plasma-materials interaction studies, including high-heat exposure of neutron-irradiated samples
- In response to the mission need, FES has begun development of the Materials Plasma Exposure eXperiment (MPEX), which is based on the Proto-MPEX Source Experiment at ORNL
  - Conceptual design of the MPEX device began at ORNL in the summer of 2018 and is currently ongoing, with completion expected by the end of summer 2019
- Construction of the MPEX device will result in a significant expansion of fusion materials science experimental capabilities in the U.S.

Proto-MPEX Source Experiment

MPEX conceptualization



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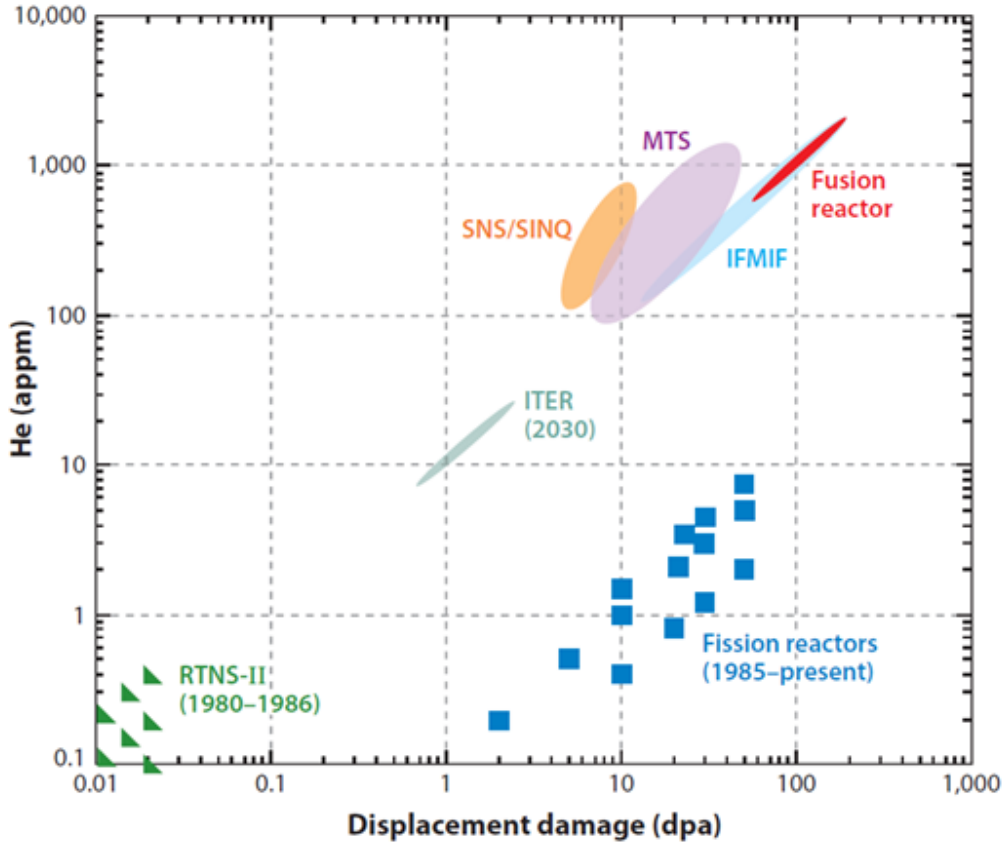
Fusion Prototypic Neutron Source Workshop

- **Workshop**: 33 members of the US fusion materials community, the Virtual Laboratory for Technology, and private industry met on August 20-22, 2018 to discuss the possibility of the US exploring a near-term, low cost Fusion Prototypic Neutron Source
- **Outcome**: Initial discussion indicated that there is significant scientific value in an intermediate next-step device on the road to IFMIF or one of its variants (e.g., DONES/AFNS)
  - The source must be "near term" (construction possible in ≤ 3 years) and of moderate cost
  - The goal is to provide scientific understanding to enable an Fusion Nuclear Science Facility, not engineering date required for full licensing
- **Minimum required source characteristics:**
  - 8-11 dpa/CY in the high flux zone
  - ~10 appm He/dpa in Fe
  - ≥ 50 cm3 in the high flux zone
  - 300 – 1000 °C, with three independent temperature zones actively monitored and controlled
  - Flux gradient ≤ 20%/cm in the plane of the sample



Summary of He dose relationships important for steels

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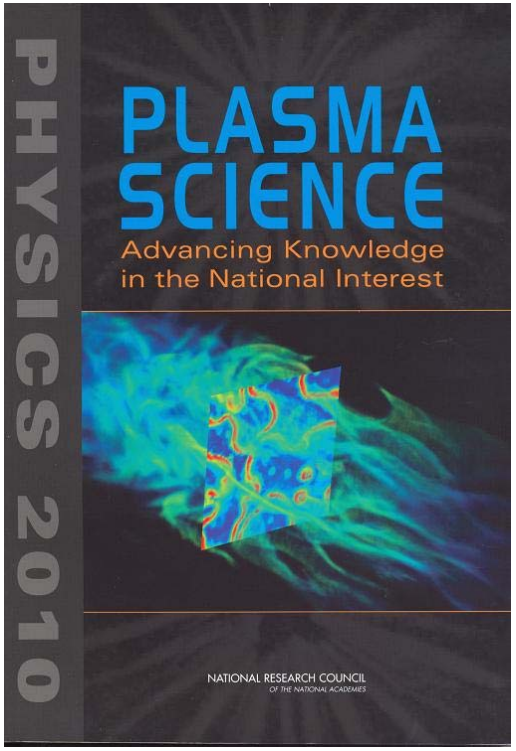
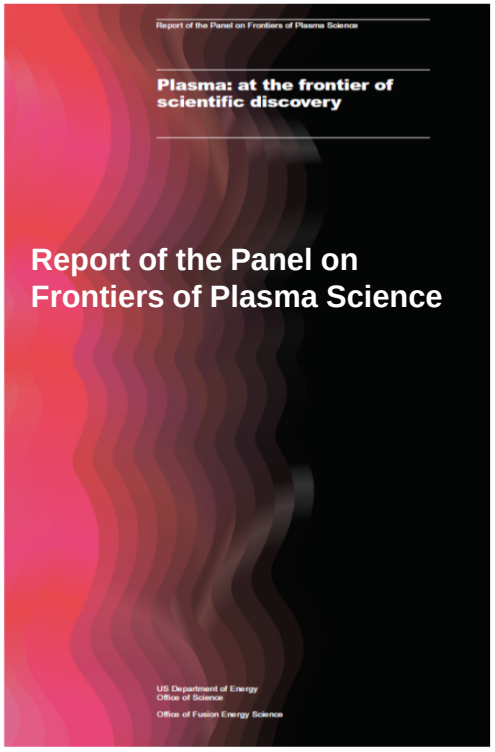
A new intermediate-scale user facility for dusty plasma research was awarded in 2018



"Several areas of basic plasma science would benefit from new intermediate-scale facilities." (2010 Decadal Study)



"There is a need for creation and exploration of new regimes in the laboratory." (2016 PSF Report)

FES awarded $1.5M of FY18 funds over three years to Auburn University to operate the Magnetized Dusty Plasma Experiment (MDPX), an intermediate-scale, integrated, collaborative plasma science user facility

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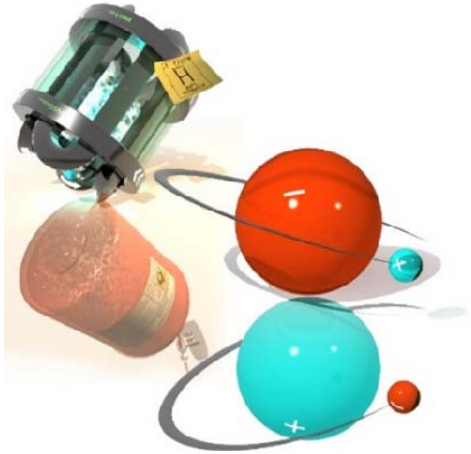
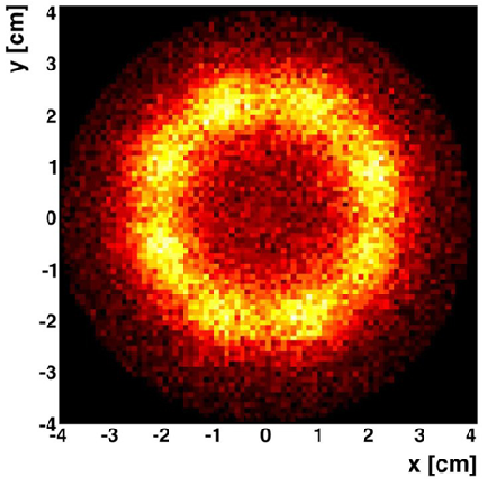
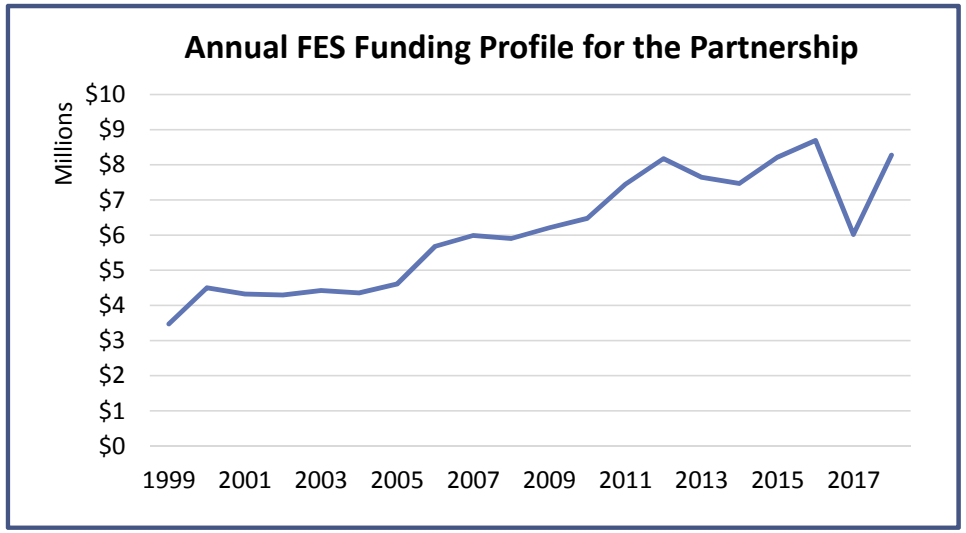
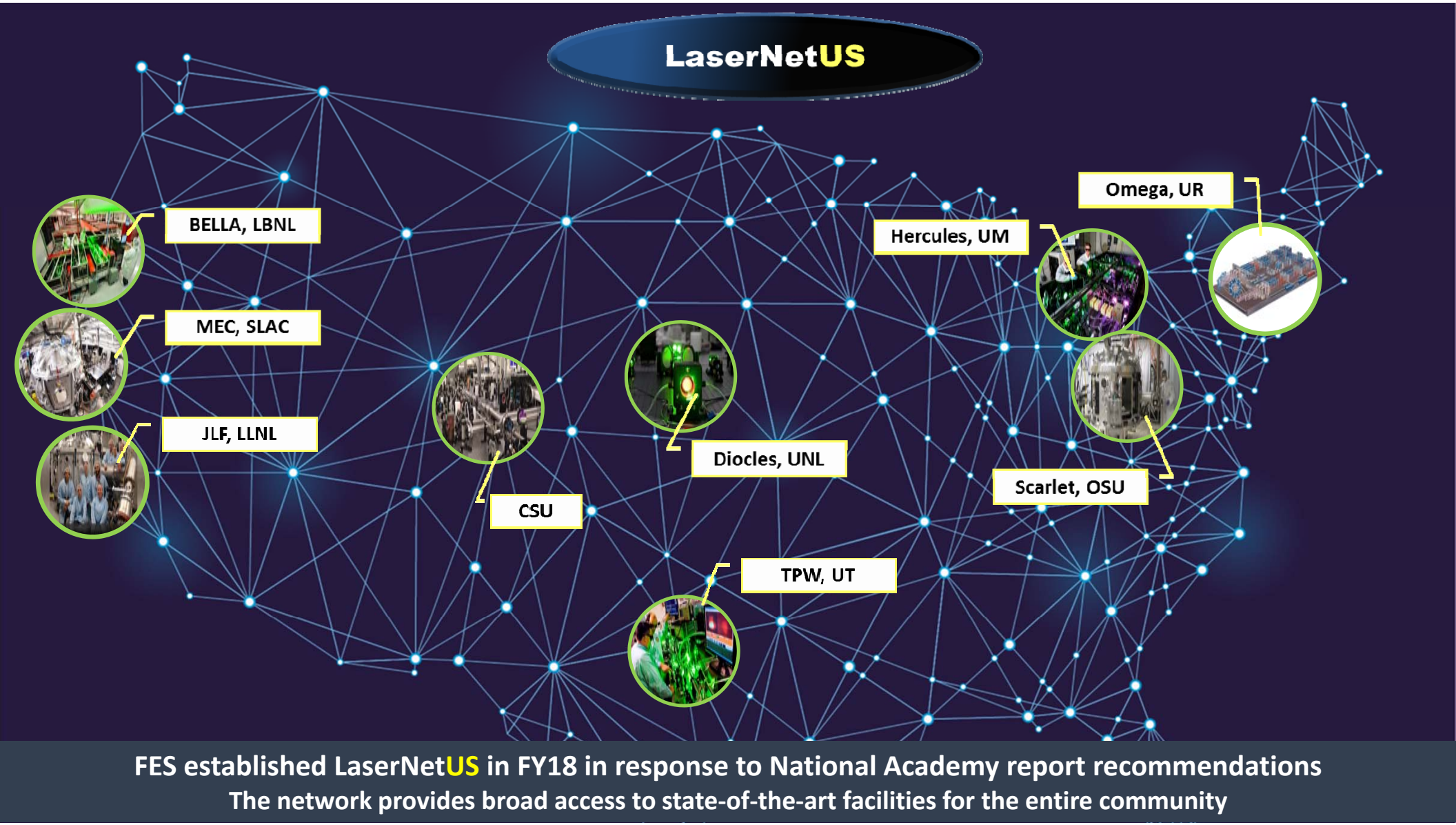
NSF/DOE Partnership: Over $8 million funded by FES in 2018







- FES provided $8.3 million FY18 funds for the Partnership, supporting 11 new or renewal proposals in basic plasma, non-neutral/dusty plasma, HED plasma, and low temperature plasma
- This includes $2.5 million over five years for antihydrogen research led by the University of California-Berkeley, collaborating with ALPHA
- Also, includes $2.3 million for Basic Plasma Science User Facility's (BaPSF) continuing operation and research at UCLA



FES established LaserNetUS in FY18 in response to National Academy report recommendations

The network provides broad access to state-of-the-art facilities for the entire community

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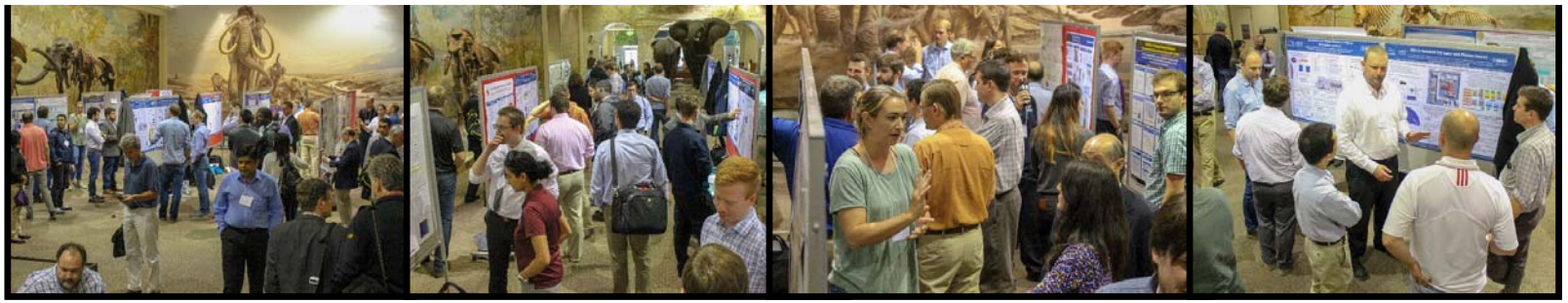
LaserNetUS First Annual Meeting

60 Posters mainly from students and postdocs



3. ITER Updates

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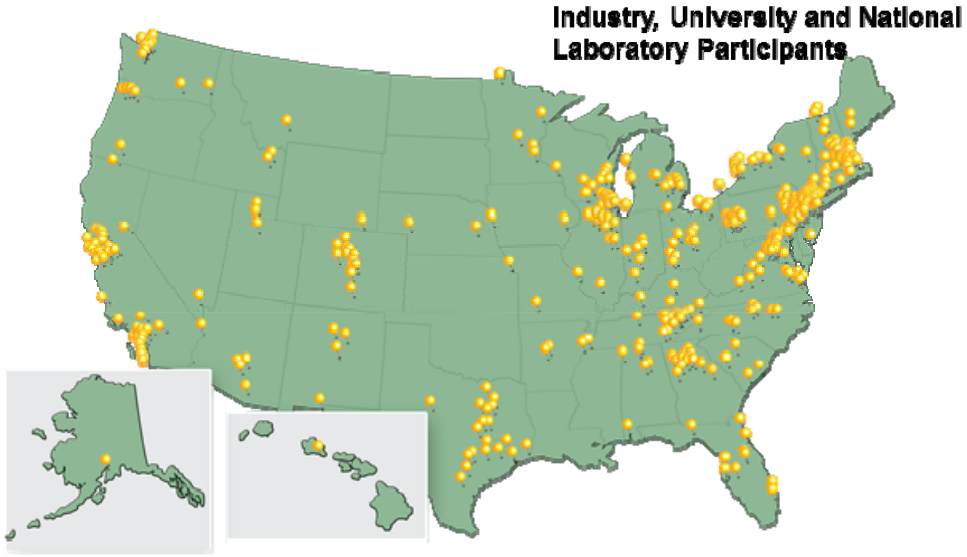
Progress of U.S. ITER project

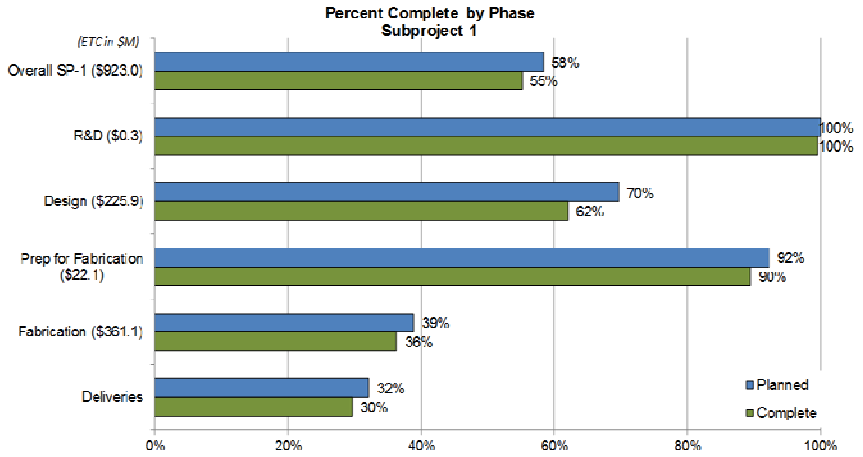
Total Contract Awards: ~$1B
as of June 2018

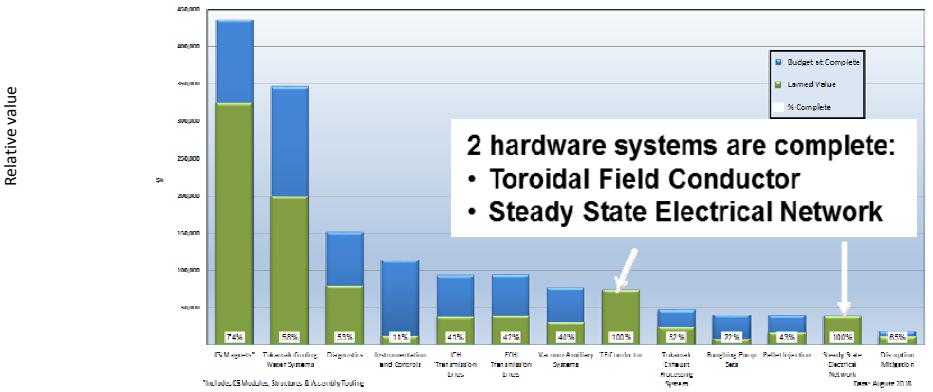
>80% of fabrication awards for U.S. ITER project remain in the U.S.

- 600+ contracts to U.S. industry, universities, and national laboratories in 44 states
- 500+ direct jobs, 1100+ indirect jobs per year



US ITER Subproject-1 (First Plasma) is 55% complete





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Current status of ITER complex

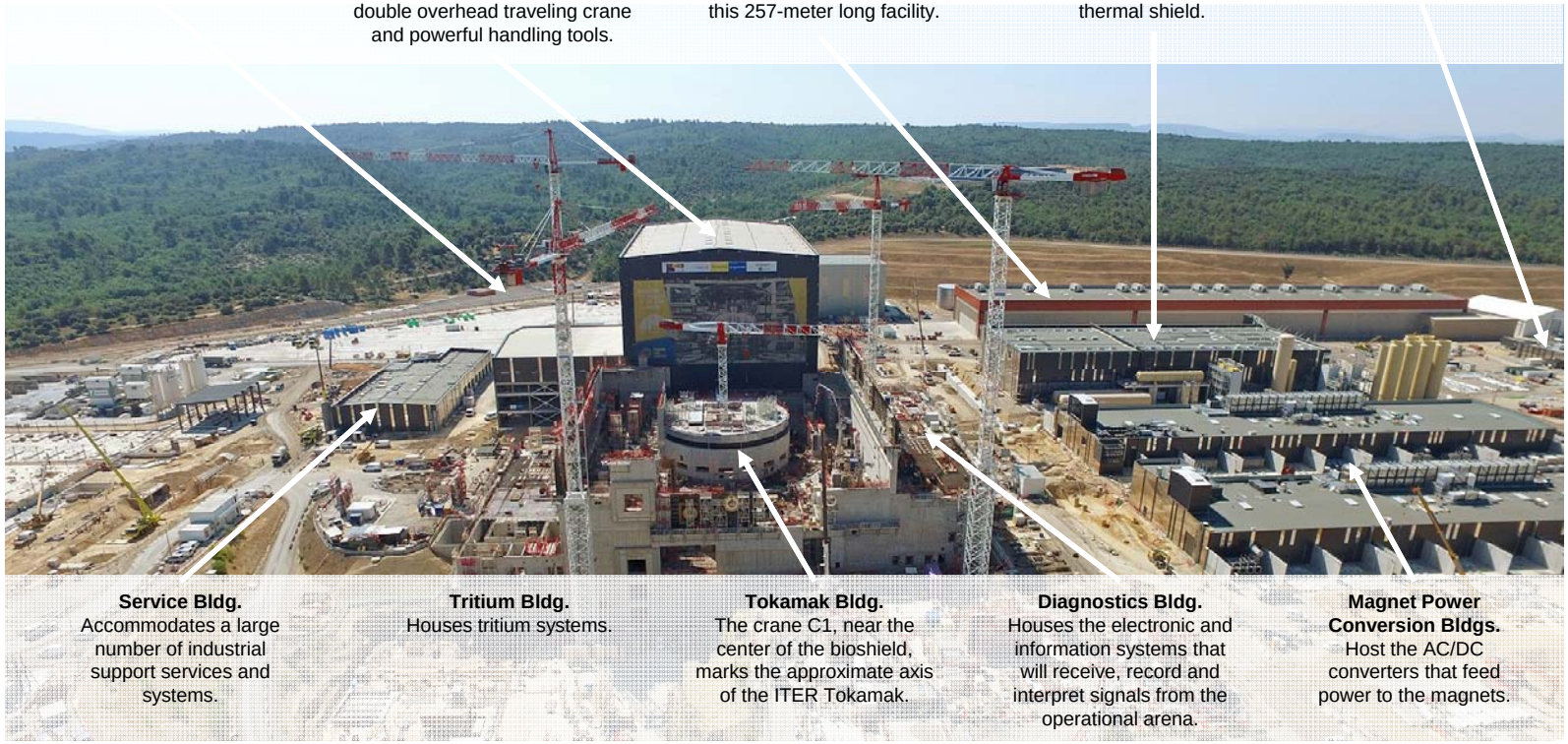
Radio Frequency Bldg.
Hosts the radio wave-generating systems that will contribute to heating the plasma.

Assembly Hall
Components will be pre-assembled in this 6,000-square-meter building, equipped with a double overhead traveling crane and powerful handling tools.

Poloidal Field Coils Winding Facility
Four of the six poloidal field coils will be produced by Europe in this 257-meter long facility.

Cryoplant
Will provide coolant to the Magnet Systems, the cryopumps and the thermal shield.

400 kV Switchyard
Connects the site to the grid.



Service Bldg.
Accommodates a large number of industrial support services and systems.

Tritium Bldg.
Houses tritium systems.

Tokamak Bldg.
The crane C1, near the center of the bioshield, marks the approximate axis of the ITER Tokamak.

Diagnostics Bldg.
Houses the electronic and information systems that will receive, record and interpret signals from the operational arena.

Magnet Power Conversion Bldgs.
Host the AC/DC converters that feed power to the magnets.

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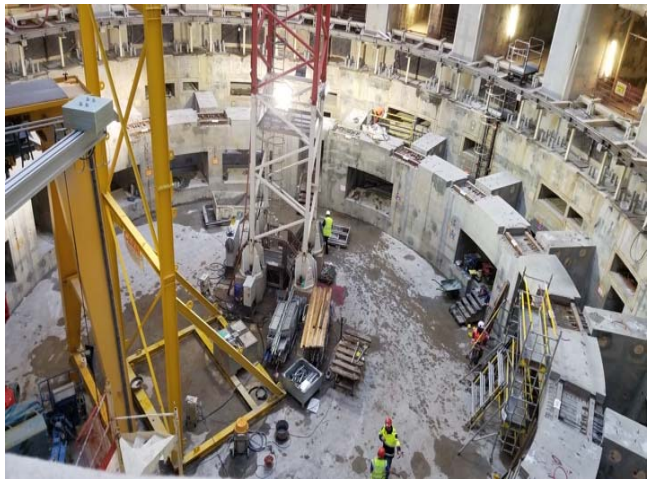
First machine component brought into the ITER tokamak pit

The tokamak complex continues to take shape. The tokamak bioshield is now hidden behind the walls of the tokamak building.

On November 26, the first machine component - a cryostat feedthrough for poloidal field coil #4 - entered the tokamak pit. This is no small feat; the component is 10 meters long and weighs 6.6 tons. This auspicious occasion marks the beginning of five years of tokamak assembly activities.

The tokamak pit is being prepared for the first tokamak components.

Photos & text from USBPO eNews



On the night of November 26, the first machine component was delicately lowered 30 meters down onto the tokamak pit floor, marking the beginning of five years of intense assembly activities. ©ITER Organization.

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Examples of U.S. hardware for ITER

First U.S. hardware installed in the Tokamak Complex
Drain tanks fabricated in the U.S. were also the first nuclear-certified components delivered to the ITER site.

Energizing of the Steady State Electrical Network delivered by the U.S. to the ITER site

Central Solenoid Module 1 at General Atomics (Poway, CA facility)

Drain tank being lifted into the tokamak facility

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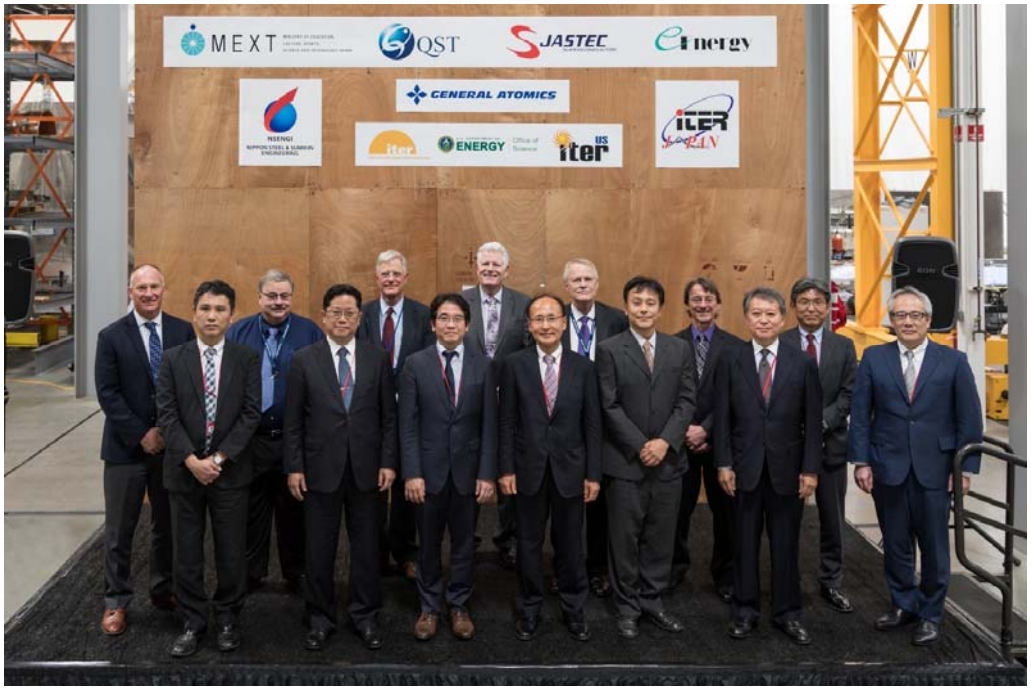
Office of Science

MEXT-QST-DOE-GA celebration of final delivery of Japanese superconductor for ITER central solenoid

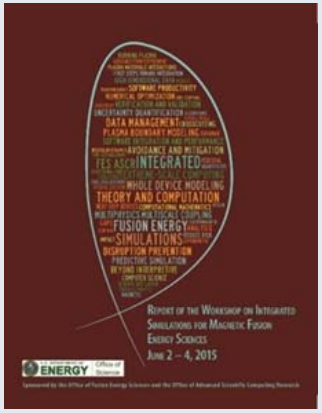


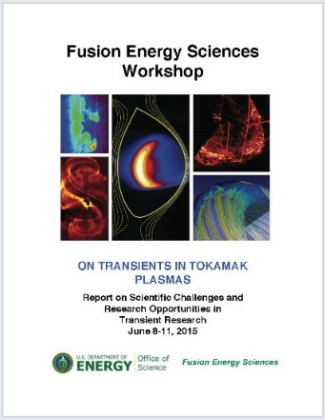
May 3, 2018 at General Atomics:
51 spools of niobium-tin superconductor = 43 km

4. Program Planning

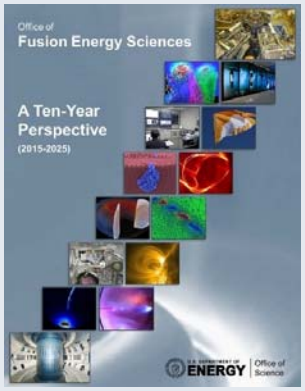
U.S. DEPARTMENT OF ENERGY
Office of Science

FES strategic choices are informed by community and Advisory Committee input

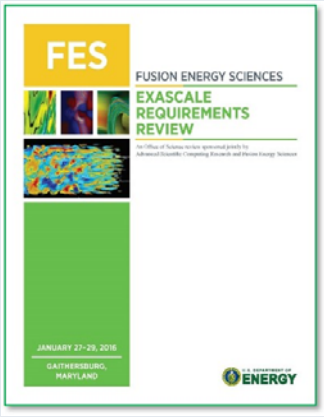




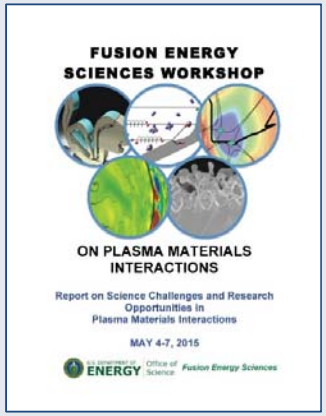
2015 Applications of Fusion Energy Sciences Research



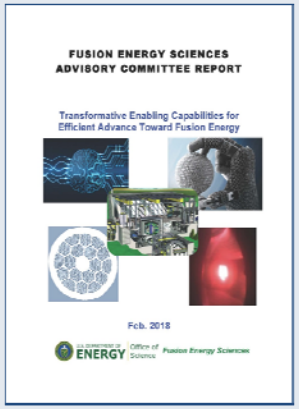
2015 FES 10-year Perspective



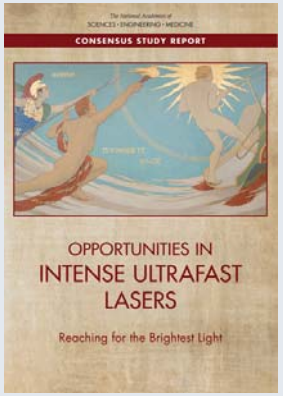
2016 FES Exascale Requirements



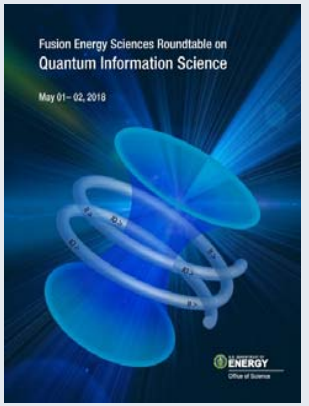
2015 Community Workshops:
Integrated Simulations, Transients, Plasma Materials Interactions, & Plasma Science Frontiers



2018 FESAC Transformative Enabling Capabilities



2017 FES NAS Report on Intense Ultrafast Lasers



2018 FES Roundtable on QIS

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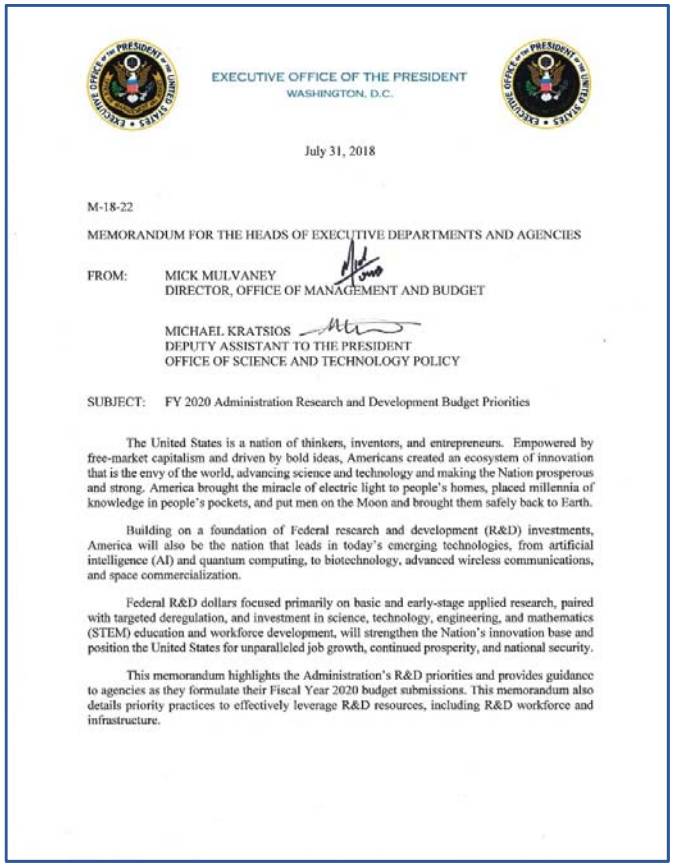
Office of Science

FES program can address several Administration R&D priorities and practices

- **American Leadership in emerging technologies**: FES investments in transformational technologies such as machine learning, quantum information science (QIS), microelectronics, and high-performance computing could accelerate progress in several mission areas.
- **American Energy Dominance**: Research in fusion could contribute to American energy dominance by making available to the American people a robust base-load electricity clean energy technology that relies on widely available and virtually inexhaustible fuel sources.
- **Managing and Modernizing R&D Infrastructure**: Investments in our major fusion facilities and smaller-scale experiments would maintain and modernize our research infrastructure for continuing to conduct world-leading research.
- **Maximizing Agency Coordination :** Established partnerships within DOE (ASCR, BES, NNSA) and outside (NSF) maximize leverage and increase the cost effectiveness of FES research activities.
- **Partnering with Industry:** Private-public collaborations would leverage opportunities in critical fusion research areas (e.g., diagnostics, theory and simulation, materials science, and magnet technology).
- **Technology Transfer**: Research on high-temperature superconductors, additive manufacturing, low-temperature plasmas, and high-energy-density plasmas lead to connections with and spinoffs for U.S. industry.
- **Workforce Training & Education:** The scientific challenges and rigor of fusion plasma physics research contribute to the development of a well-trained STEM-focused workforce, which would help maintain and advance U.S. competitiveness and world-leadership in key areas of future technological and economic importance, as well as national security.



EXECUTIVE OFFICE OF THE PRESIDENT
WASHINGTON, D.C.

July 31, 2018

M-18-22

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: MICK MULVANEY
DIRECTOR, OFFICE OF MANAGEMENT AND BUDGET

MICHAEL KRATSIOS
DEPUTY ASSISTANT TO THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: FY 2020 Administration Research and Development Budget Priorities

The United States is a nation of thinkers, inventors, and entrepreneurs. Empowered by free-market capitalism and driven by bold ideas, Americans created an ecosystem of innovation that is the envy of the world, advancing science and technology and making the Nation prosperous and strong. America brought the miracle of electric light to people's homes, placed millennia of knowledge in people's pockets, and put men on the Moon and brought them safely back to Earth.

Building on a foundation of Federal research and development (R&D) investments, America will also be the nation that leads in today's emerging technologies, from artificial intelligence (AI) and quantum computing, to biotechnology, advanced wireless communications, and space commercialization.

Federal R&D dollars focused primarily on basic and early-stage applied research, paired with targeted deregulation, and investment in science, technology, engineering, and mathematics (STEM) education and workforce development, will strengthen the Nation's innovation base and position the United States for unparalleled job growth, continued prosperity, and national security.

This memorandum highlights the Administration's R&D priorities and provides guidance to agencies as they formulate their Fiscal Year 2020 budget submissions. This memorandum also details priority practices to effectively leverage R&D resources, including R&D workforce and infrastructure.

July 31, 2018 OMB memo on the FY 2020 Administration R&D priorities

U.S. DEPARTMENT OF ENERGY
Office of Science

National Academy burning plasma interim report was issued on December 21, 2017


PREPUBLICATION COPY – SUBJECT TO FURTHER EDITORIAL CORRECTION

INTERIM REPORT OF THE
COMMITTEE ON A STRATEGIC PLAN
FOR U.S. BURNING PLASMA RESEARCH

Committee on a Strategic Plan for U.S. Burning Plasma Research
Board on Physics and Astronomy
Division on Engineering and Physical Sciences

A Consensus Study Report of
The National Academies of
SCIENCES • ENGINEERING • MEDICINE

THE NATIONAL ACADEMIES PRESS
Washington, DC
www.nap.edu

The interim report notes that:

- Burning plasma research is essential to the development of magnetic fusion energy
- The U.S. has contributed leading advances in burning plasma science
- ITER is the only existing project to create burning plasma at reactor scale
- The U.S. should develop a national strategic plan leading to a fusion demonstration device

Full report is expected by the end of 2018

U.S. DEPARTMENT OF ENERGY
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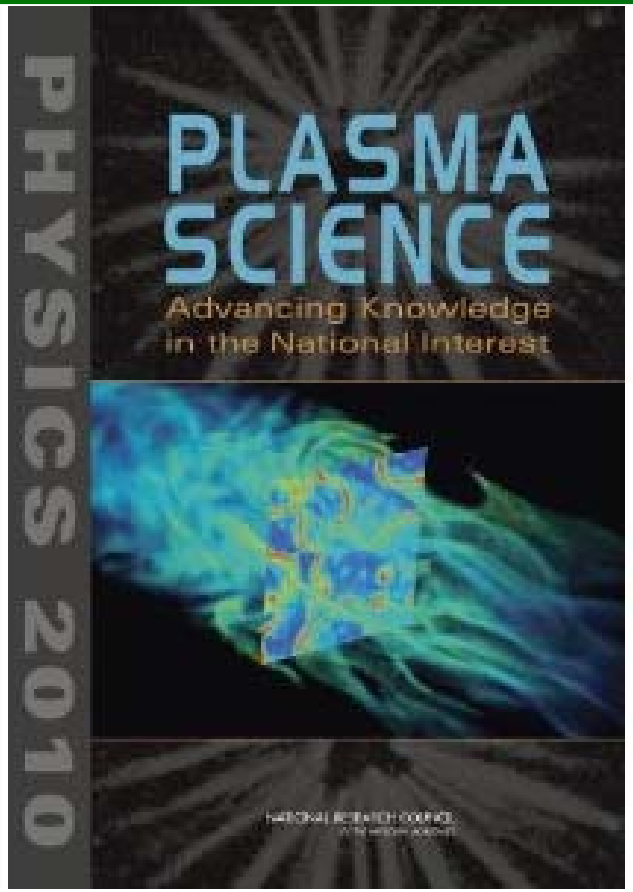
Physics 2020: A Decadal Assessment of Plasma Science



2010 Plasma Decadal Survey
(Chair: Steve Cowley)

- **Objective**
  Conduct a study of the past progress and future promise of plasma science and technology and provide recommendations to balance the objectives of the field in a sustainable and healthy manner over the long term
- **Multiple federal sponsors**
  - DOE (FES, HEP, NNSA, ARPA-E)
  - NSF
  - DOD (AFOSR, ONR)
- **Co-Chairs:**
  - Mark J. Kushner (U. Michigan)
  - Gary P. Zank (U. Alabama-Huntsville)
- **Names and bios of committee members:**
  https://www8.nationalacademies.org/pa/projectview.aspx?key=51149
- **Meetings so far:**
  - First public committee meeting was held on October 15
  - Town Hall was held November 6 during APS-DPP Meeting
  - Next meeting will be December 10-11 (NAS Irvine)
- **Report at this meeting by Prof. Kushner**

U.S. DEPARTMENT OF ENERGY
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National Academy report on intense ultrafast lasers

Recommendations

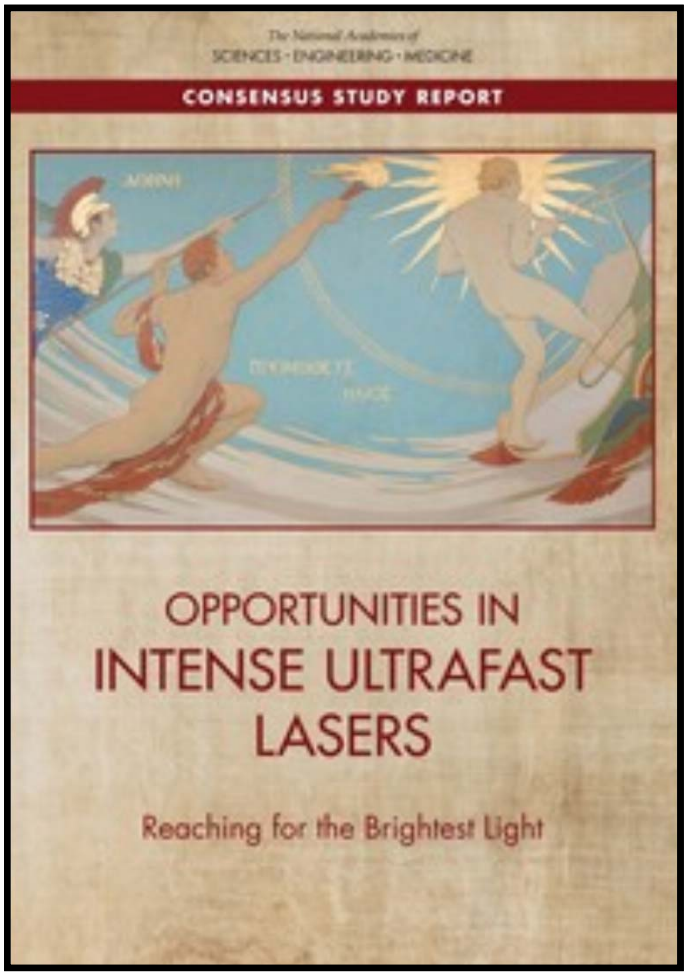
1. **DOE should** create **a broad national network** (universities, industry, government labs) in coordination with OSTP, DOD, NSF, and others.

2. US research agencies should engage stakeholders to **define facilities and laser parameters** that will best serve research needs.

3. **DOE should** lead development of **an interagency national strategy** for developing and operating large- and mid-scale projects, and developing technology.

4. **DOE should** plan **for at least one large-scale open-access, high-intensity laser facility** that leverages other major science infrastructure in the DOE complex.

5. Agencies should create U.S. programs that **include mid-scale infrastructure, project operations, development of technologies; and engagement in research at international facilities such as ELI.**



U.S. DEPARTMENT OF ENERGY
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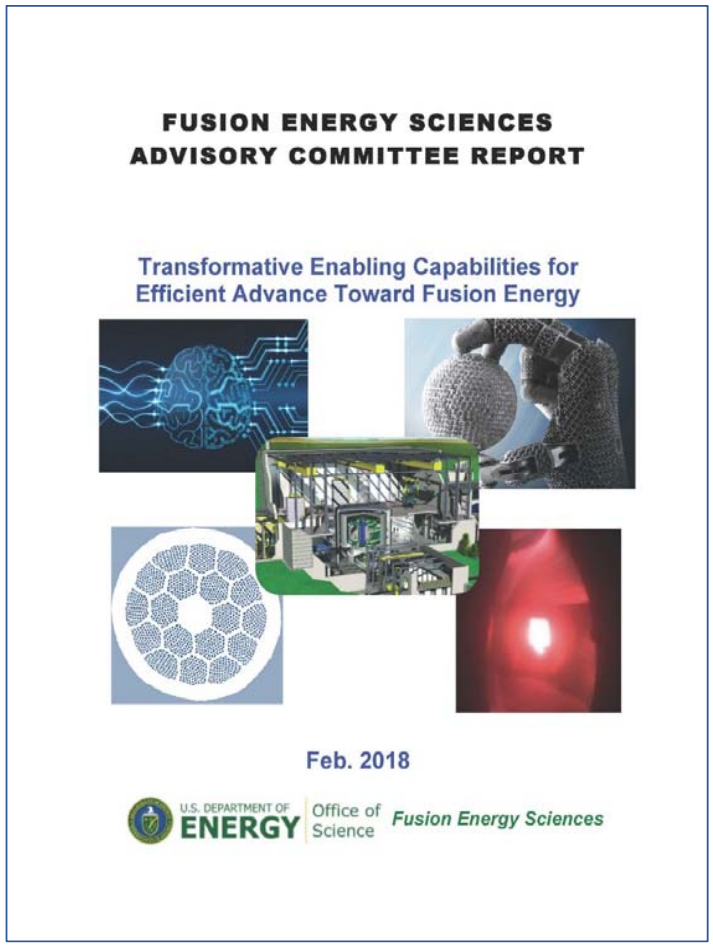
FESAC report on Transformative Enabling Capabilities toward Fusion Energy

- FESAC was charged with identifying the most promising Transformative Enabling Capabilities (TECs) for promoting efficient advance towards fusion energy, building on burning plasma science and technology
- The fusion community provided 67 white papers and 67 presentations at three meetings as input to FESAC
- The FESAC report identified the following four first-tier (most promising) TECs:
  - Advanced algorithms
  - High critical-temperature superconductors
  - Advanced materials
  - Novel technologies in tritium fuel-cycle control.
- The report also noted one second-tier (promising) TEC:
  - Fast-flowing liquid-metal plasma-facing components.
- The report was presented at the Feb 2018 FESAC meeting



FESAC meeting this week

- **FESAC meeting is scheduled for December 6 and 7**
  - Detailed information is posted on the FESAC website: https://science.energy.gov/fes/fesac/meetings/
  - Remote participation will be possible

- **Agenda items include:**
  - DOE leadership presentation (Undersecretary for Science Paul Dabbar): Dec 7, 9:30 a.m.
  - FES status report
  - Report from the FESAC Committee of Visitors review (August 2018)
  - Report from the FES Roundtable on Quantum Information Science (May 2018)
  - Report from the Fusion Prototypic Neutron Source workshop (August 2018)
  - Report about NAS Decadal Assessment of Plasma Science
  - A new charge on long-range strategic planning for the FES program

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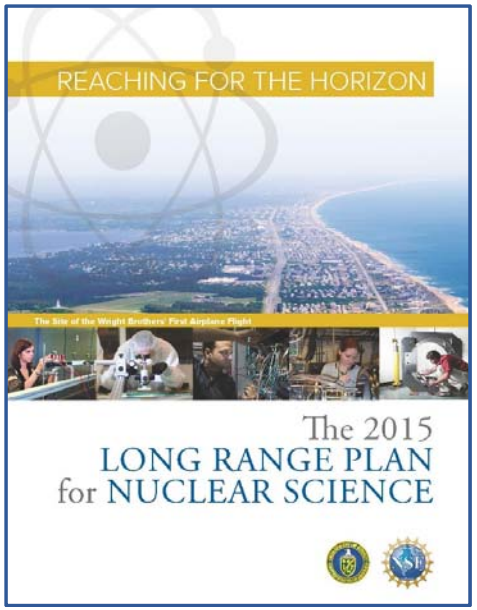
Long-range strategic planning activity for FES program

- Recent community input via workshops and other activities have informed the strategic priorities of the FES program, as reflected in the *FES Ten-Year Perspective* plan
- The community self-organized two workshops last year to provide valuable input to the burning plasma study by the National Academy of Sciences
- We are now ready to take the next step toward the development of a comprehensive long-range plan for the FES program, following a process similar to the one used by the Office of Science High Energy Physics and Nuclear Physics programs for the development of the HEP P5 report and the NP Long Range Plan
- The plan will be comprehensive, including all FES program areas (viz., MFE, General Plasma Science, HEDLP, etc.)
- A charge is being issued to FESAC this week
- FESAC subcommittee activities will be preceded by intensive community activities (e.g., workshops, townhall meetings, etc.) to be coordinated by APS-DPP and APS



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Fusion program prioritization will adapt the HEP (P5) and NP (LRP) processes

Phase 1: Community-organized activities

Community Awareness
Inform the community that a FESAC charge is coming

Done (Nov 5 letter)

↓

Subfield community self-organization
Community plans how to fill gaps from Madison & Austin meetings

In process (thanks to DPP)

↓

FESAC charge issued
18-24 month clock starts with budget guidance/scenarios

This week

↓

FES tasks APS-DPP to convene topical town hall meetings
Subfield white papers, talks, virtual meetings (esp. early-career scientists); build on 2017-2018 community organization and NAS reports; community demographics & diversity; followed by homework revisions & priorities

↓

"Snowmass" meeting
~10 day meeting where all subfields attend

Fusion program prioritization will adapt the HEP (P5) and NP (LRP) processes

Phase 2: FESAC Working Group

FESAC chair & vice chair select Working Group with FES concurrence
Solicit nominations from community; working group meetings discussing the four frontiers

↓

FESAC Working Group convenes Resolution Meeting
5 days with open & closed sessions; discussions and writing sessions with final draft recommendations

↓

FESAC vote & report transmittal

↓

Stakeholder briefings
FES community, OMB, OSTP, Congress, international partners

5. People

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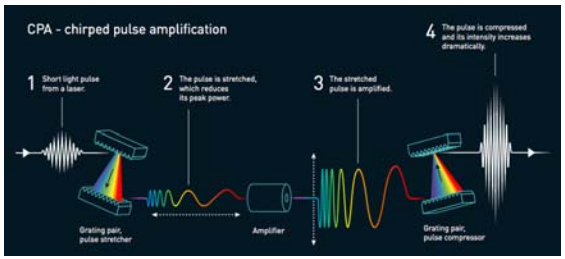
2018 Nobel Physics Prize for CPA led to the development of high-power lasers for HEDP

2018 Nobel Prize in Physics

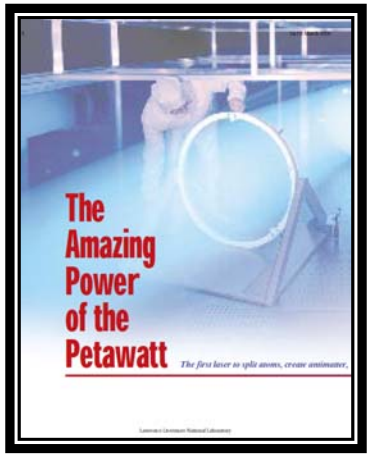
Donna Strickland & Gerard Mourou: "Compression of amplified chirped optical pulses" (Optics Communications, 1985)

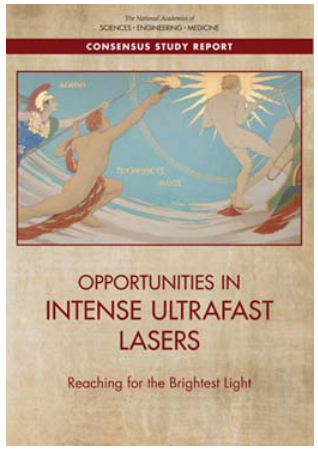


Chirped pulse amplification (CPA)

Congratulations!

- **First Petawatt Laser**
- **LLNL, May 23, 1996**





Congratulations to Sir Steve

Investiture ceremony at Buckingham Palace (October 11, 2018)

- KNIGHTS BACHELOR, Sir Steven Charles Cowley FRS FREng
- “For services to Science and to the Development of Fusion Energy”

U.S. DEPARTMENT OF ENERGY
Office of Science

DOE senior leadership updates

Mr. **Paul M. Dabbar** was sworn in as Under Secretary for Science on November 7, 2017

- Has visited a number of U.S. and overseas fusion facilities and institutions

Dr. **Chris Fall** was nominated on May 18, 2018, as the Director of the DOE Office of Science

- Dr. Fall is presently the Principal Deputy Director of ARPA-E
- Subcommittee hearing was held June 26, 2018
- Awaiting final Senate confirmation

Mr. **Kurt Heckman** is a senior advisor in the Office of Science

- Will work for the incoming Director of the Office of Science

U.S. DEPARTMENT OF ENERGY
Office of Science

FES staff updates

Dr. **Mark Foster** entered phased retirement status in July 2018

- He is working half-time, assisting Matt Lanctot and Curt Bolton to assume program manager responsibilities for DIII-D and Measurement Innovation programs, respectively

Mr. **Jeff Thomas** (PE, PMP, CCP) joined FES on September 16, 2018

- He is the new ITER program manager

Dr. **Sam Barish** plans to enter phased retirement status later in December 2018

- He will work half-time
- He will continue to manage the stellarator program and FESAC
- Other duties will transition elsewhere

Dr. **Guinevere Shaw** will join FES on December 9, 2018

- She will manage the fusion nuclear science portfolio